

# Appendix D

## CAMOUFLAGE

---

### DETECTION

Modern sensing devices detect objects or terrain disturbances even though they are well camouflaged. These devices detect reflected short-wave and radiated long-wave infrared (ir) energy. Special video devices “read” ir energy and detect dead or dying vegetation as well as objects painted similar to their surroundings. As a counter, special camouflage paint having a short-wave infrared response much like natural vegetation is available. The long-wave or thermal infrared energy radiated by a surface depends on the surface temperature. Hot surfaces radiate much more energy than cool surfaces; thus, hot surfaces are normally easier to detect with thermal infrared or heat-sensitive devices. Certain precautions are taken against detection by these devices.

- Hot objects such as generators, stoves, or other heat-generating items are not openly exposed.
- Artificial surfaces are shaded or insulated to reduce solar heating.
- Distinctive shapes or patterns which readily identify the type of feature or facility are obscured.

If natural material is used for camouflage, there are two major considerations. *First*, gathering natural material nearby creates voids, changes the appearance of the natural surroundings, and reduces the effectiveness of the camouflage. Therefore, limbs are cut from several trees, not just one. Also, limbs are cut as close to the trunk or main branch as possible. A tree should still appear “natural” after branches are cut. *Secondly*, while natural material aids both visual and infrared camouflage initially, it loses effectiveness as it dries out. Thus, when vegetation is cut for camouflage use, it is watered and/or

replaced as it withers. The replaced camouflage is disposed of so that it does not draw attention to the concealed area. Excess soil from constructed positions, waste materials, and any worn or damaged camouflage are moved to another area and made to look like natural terrain. These materials are also used for constructing a poorly camouflaged dummy position.

Regardless of the materials used to camouflage a bivouac site, both visual and infrared capabilities are considered. For example, a field fortification constructed of galvanized steel is set in a grassy area. During midday, the steel appears unnaturally bright to both visible and thermal infrared sensing devices. In the visible range, it reflects more light than the grass and differs in color. In the short-wave infrared range, it appears darker than the surrounding vegetation. In the thermal infrared range, it is much hotter than sod or vegetation. Sodding the roof camouflages the position for all three types of

always possible, artificial materials are used. Paint or nets, such as those used on vehicles, may help. Paint protects against detection by visible and short-wave infrared devices, but shading by nets reduces the thermal infrared signature and thus the detectability of the site to heat-sensitive devices.

### Natural Materials

Natural materials are used for the three methods of concealment—hiding, blending, and disguising. Indigenous materials provide the best concealment, are economical, and reduce logistic requirements. For camouflaging, natural materials are divided into four groups: growing vegetation (cut and planted), cut and dead vegetation, inert substances of the earth, and debris.

Cut vegetation is used for temporary concealment, completing or supplementing natural cover, and augmenting artificial cover. It is also excellent for overhead screening if cuttings are carefully placed to appear as in the natural state. Cut foliage wilts and is therefore replaced frequently (every 3 to 5 hours). In addition, cutting large amounts reveals the site. Inert substances such as cut grass, hay, straw, or dead branches require very little maintenance. However, because of their dry nature, these items are a potential fire hazard and lose their ability to provide infrared detection protection. Inert materials are ideal when vegetation is dormant.

Other substances such as soil, sand, and gravel are used to change or add color, provide coarse texture, simulate cleared areas, or create shapes. Debris such as boxes, tin cans, old bottles and junkyard items are also used for camouflage in some cases. In winter, snow is used, but some differences are expected between undisturbed and reworked snow, especially with infrared detection devices.

### **Man-Made Materials**

Man-made materials fall into three categories: hiding and screening, garnishing and texturing, and coloring.

*Hiding and screening materials* include prefabricated nets, net sets, wire netting, snow fencing, truck tarpaulins, smoke, and so forth. Generally, these materials are most effective when used to blend with natural overhead or lateral cover.

*Garnishing and texturing materials* are used to add the desired texture to such items as nets and screens. Examples of such materials are gravel, cinders, sawdust, fabric strips, feathers, wood shoring, and Spanish moss.

Coloring with standard camouflage paint, available in ten colors in addition to black and white, allows selecting a color scheme which blends with any natural surrounding. Normally, standard camouflage paint has a dull finish, is nonfading, possesses a certain degree of infrared reflectivity, covers in one coat, and lasts approximately 9 months. If this paint is not available, other materials such as crankcase oil, grease, or field-expedient paint can be used as a stopgap measure.

### **FIELD SITE DEVELOPMENT**

The four stages in the development of a field site are planning, occupation, maintenance, and evacuation. Since units often move without an opportunity to plan, the first stage is sometimes eliminated. In that case, the five points listed in the following paragraph are satisfied after arrival to the area.

#### **Planning**

Because of the frequent halts characteristic of modern mobile warfare, planning is difficult. Since there is seldom time or facilities available for elaborate construction, sites are quickly entered and evacuated. However, no matter how swift the operation or how limited the time and facilities, the unit commander plans for concealment. The general area of the halt is determined by the tactical plan. Prior to entering the area, the quartering party becomes familiar with the terrain pattern through a careful study of maps and aerial photographs. The party is also fully acquainted with the tactical plan and the camouflage requirements. The five critical points for the party are:

- Unit mission.
- Access routes.
- Existing concealment.

- Area size.
- Concealment of all-around position defense.

Camouflage begins before the unit moves in to occupy the site. Vehicles are carefully controlled in their movements so telltale tracks do not lead directly to a camouflaged position. All traffic moves on existing roads or trails or follows tree lines.

### **Occupation**

Occupation is achieved with a carefully controlled traffic plan which is strictly followed. Guides posted at route junctions, fully aware of the camouflage plan, enforce camouflage discipline. Turn-ins are marked to prevent widening of corners by vehicles. Foot troops follow marked paths as closely as possible. The position is sited so that it is not silhouetted against the sky when viewed from an attacker's ground position. It also blends—not contrasts—into the background.

Maximum use of trees, bushes, and dark areas of the terrain reduces the amount of camouflage required and the likelihood of air observation. It is equally important that the concealing cover not be isolated, since a lone clump of vegetation or a solitary structure is a conspicuous hiding place and will draw enemy fire whether the enemy "sees" anything or not. The terrain should look natural and not be disturbed any more than absolutely necessary. This objective is best accomplished by removing or camouflaging the spoil.

Natural terrain lines, such as edges of fields, fences, hedgerows, and rural cultivation patterns, are excellent sites for positions since they reduce the possibility of aerial observation. Regular geometric layouts are

avoided. The lightweight camouflage screening system (LWCSS) is especially important in preventing identification of recognizable military outlines.

Before any excavation is started, all natural materials, such as turf, leaves, forest humus, or snow, are removed, placed aside, and later used for restoring the natural appearance of the terrain. When a position cannot be sited under natural cover, camouflaged covers are valuable aids in preventing detection. Materials native to the area are preferred; however, when natural materials are used over a position, they must be replaced before they wilt, change color, and lead to detection.

### **Maintenance**

Next to occupation, maintenance is the most critical stage. If the occupation was successful from a camouflage standpoint, maintenance is relatively simple. Successful maintenance involves frequent inspection of camouflage; active patrol measures for discipline; and, where possible, aerial observation and photos. When critical unit activities require congestion of troops, such as for dining, the traffic plan must be rigidly enforced. It is often necessary to use artificial overhead cover, such as LWCSS. Garbage disposal pits are concealed, with special care given to the spoil. During hours of reduced visibility, it is human nature to relax and assume that the enemy cannot see during darkness or in fog; however, the maintenance of noise and light discipline, as well as camouflage, is important at all times. Failure to maintain light and noise discipline may make all other methods of camouflage ineffective. Even during periods of reduced visibility, an exposed light can be seen for several miles. Any unusual noise or noise common to military activity may draw attention to its source.

New thermal imagery technology is capable of detecting equipment not covered by thermal camouflage nets, regardless of light or weather conditions. Generators, heaters, or any other running engines create additional thermal signatures which must be limited as much as possible. As a result, stricter camouflage discipline is required during the hours of reduced visibility, since a camouflage-undisciplined unit will become even more recognizable. Wire and taped paths will aid personnel in finding their way with minimum use of flashlights.

### **Evacuation**

Although evacuation is the last operation at the halt site, camouflage does not end when the unit prepares to move out. An evacuated area can be left in such a state that aerial photos reveal the strength and type of unit, its equipment, and even its destination. It is an important part of camouflage to leave the area looking undisturbed. Trash is carefully disposed of or taken with the unit. Spoil is returned to its original location to assume a unit is not engaged when it departs. If engaged, it may not be possible to return the site to its original appearance.

## **CAMOUFLAGE OF UNIT POSITIONS**

### **Command Post**

Since the command post is the nerve center of a military unit, it is a highly-sought enemy target. Command posts have functional requirements which result in creating easily-identifiable signatures such as—

- Converging communication lines, both wire and road.
- Concentration of vehicles.
- Heavy traffic which causes widened turn-ins.
- Antennas.

- New access routes to a position which could house a command post.
- Protective wire and other barriers surrounding the site.
- Defensive weapon positions around the site.

Primary camouflage solutions include intelligent use of the terrain and backgrounds, and strict enforcement of camouflage discipline.

### **Site Requirements**

The site requirements of a large command post are primarily reconnaissance and layout, quartering parties, rapid concealment of elements, camouflage discipline, and a well-policed track plan to prevent visitors from violating it. Since a large headquarters is likely to remain in an area for a greater length of time than a halted maneuver unit, the site must be capable of being disclosed by changes in the terrain pattern. It is unwise to locate a headquarters in the only large building within an extensive area of operations. If the command post is located in a building, there must be other buildings in the area to prevent the target from being pin pointed.

### **Communications**

Communications are the lifeblood of a command post. Command posts sited to take advantage of existing roads and telephone and telegraph wires are easiest to conceal. When new communication means must be created, natural cover and terrain lines are used. The use of remote communications should be concealed wherever possible.

### **Discipline**

After the site has been selected and camouflaged to supplement whatever natural concealment is present, continued concealment depends on discipline. Tracks are controlled;

vehicles are parked several hundred meters from the command post; security weapons and positions are concealed and tracks to them made inconspicuous; all spoil is concealed, and protective and communication wires follow terrain lines and are concealed as much as possible. Night blackout discipline is rigidly enforced. Routes to visitor parking areas are maintained in accordance with the track plan. Power generation equipment is also concealed to protect against noise and infrared signature detection.

In open terrain where natural concealment is afforded only by small scrub growth and rocks, overhead camouflage is obtained by using the LWCSS. Even in desert terrain, broken ground and scrub vegetation form irregular patterns and are blended with artificial materials. Digging-in reduces shadow and silhouettes, and simplifies draping positions or tents. In open terrain, dispersion is particularly important. Routes between elements are concealed or made by indirect courses—never in straight lines.

### **CAMOUFLAGE OF CIVILIAN STRUCTURES**

A headquarters within an existing civilian structure presents the problem of hiding day movement and concealing the evidence of night activity when blackout conditions prevail. Military movement in a village or a group of farm buildings is less discoverable if kept to a minimum. Attempts to alter the appearance of buildings by disruptive painting is evidence of occupation and simply reveals a military presence. Erection of a small structure simulating a new garage or other auxiliary civilian building is unlikely to arouse suspicion. Any major changes, however, especially if the enemy is familiar with the area, will be closely scanned by enemy air observers. When buildings are partially destroyed and left debris-littered, installations are camouflaged with debris to blend with the rough and jagged lines of the

surroundings. A few broken timbers, pieces of broken plaster, and a few scattered rags accomplish quick and effective concealment. Other debris usually available includes rubble, scrap metal, wrecked vehicles, and furniture.

### **CAMOUFLAGE OF SUPPLY POINTS**

Camouflage of a supply point includes all the difficulties of both maneuver unit and command post concealment, plus a number of particularly troublesome factors peculiar to supply points alone. Supply points vary in size from large concentrations of materials in rear areas, to small piles of supplies in the forward areas. Large amounts of equipment are quickly brought up, unloaded, and concealed, yet are easily accessible for redistribution. Flattops are used effectively providing the supply points are not too large, time and materials are available, and they blend with the terrain. For supply points which cannot be concealed, decoy points will often disperse the force of an enemy attack.

Natural concealment and cover are used whenever possible. Stacks of supplies are dispersed to minimize damage from a single attack. New access roads are planned using existing overhead cover. In more permanent installations, tracks running through short open areas are concealed by overhead nets slung between trees. Traffic control includes measures to conceal activity and movement at, to, and from the installation. Even when natural cover is sparse or nonexistent, natural terrain features are advantageously used.

In cultivated fields, supplies are laid out along cultivation lines and textured with strip-garnished twine nets to resemble standing stubble. In plowed fields, supplies are stacked parallel to the furrows and covered with earth-colored burlap for effective concealment. Access routes are made along the furrow, and no unnatural lines appear on the pattern.

Camouflage discipline measures at supply points include track plans that result in minimal changes to terrain appearance, debris control to prevent accumulation and enemy detection, concealment and control of trucks waiting to draw supplies, and camouflage maintenance.

### **CAMOUFLAGE OF WATER POINTS**

Effective concealment of water points and other support activities require—

- An adequately concealed road net.
- Sufficient concealment to hide waiting vehicles.
- Adequate concealment—artificial or natural—for operating personnel, storage tanks, and pumping and purification equipment.
- Strict enforcement of camouflage discipline.
- Control of spilled water and adequate drainage to prevent standing pools of water which reflect light.

Foliage not sufficiently thick for perfect concealment is supplemented by natural materials or LWCSS. Concealment is required for water point equipment, the shine of water in the tanks, and any small open areas that are crossed by vehicles or personnel. Shine on water is concealed by a canvas cover or foliage. The characteristic shape of tanks is distorted by foliage or artificial materials. Camouflage discipline at a water point requires a water supply schedule for using units. Lack of a schedule, or violation of it, usually causes a jam of waiting vehicles which cannot be concealed.

### **CAMOUFLAGE OF CREW-SERVED AND INDIVIDUAL FIGHTING POSITIONS**

If positions are expertly camouflaged and maintained, the enemy will have great difficulty in locating them until stumbling into a kill zone. Natural materials used to camouflage fighting positions should be indigenous to the area. As an example, willow branches from the edge of a stream will not appear natural in a grove of oaks. Since spoil may differ in color from the ground surface, it may be necessary to camouflage the soil or remove it from the unit area.

Routes taken by troops to fighting positions are obscured so footprints or telephone lines do not reveal the positions. All camouflage procedures used for any field location, both visual and thermal, are successfully applied and maintained.

### **CAMOUFLAGE OF OTHER DEFENSIVE POSITIONS**

Other positions are camouflaged the same way as positions located in the defensive area. Positions include those for major weapons, special design shelters, protective walls (in some cases, obstacles), and trenches.

### **CAMOUFLAGE IN SPECIAL TERRAIN**

Special terrain conditions, such as deserts, snow regions, and urban areas require special camouflage measures.

#### **Deserts**

Areas where there is no large convenient overhead cover are unplowed fields, rocky areas, grasslands, and other wide-open spaces. In certain types of flat terrain, shadow patterns and judicious use of drape nets render objects inconspicuous. Units in deserts or other featureless terrains are highly vulnerable to breaches of light or sound discipline during day or night. The eye's capability to reasonably discern stationary objects is

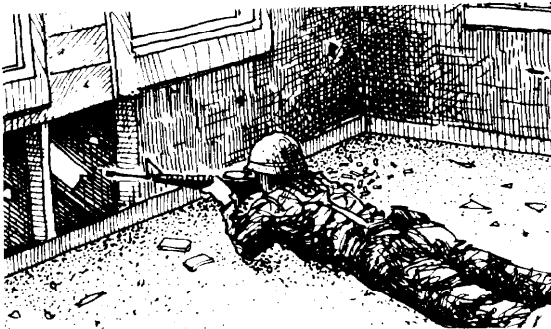
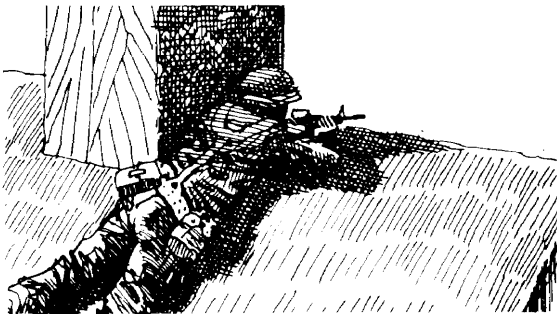
greatly reduced by this type of terrain. Dust trails from moving vehicles identify a military position faster than open, stationary, noncamouflaged vehicles. Luminosity at night in open plain areas significantly degrades depth perception and, dependent upon surface texture, makes visual observation useless at long ranges and significantly enhances sound detection methods.

A desert version of the LWCSS provides concealment against visual, near infrared, and radar target acquisition/surveillance sensor devices. A radar transparent version of the LWCSS allows US units to camouflage radar without degrading operations. The desert camouflage net is a complete cover since it depends on ground surface imitation, both in color and texture, for effect.

### **Snow Regions**

A blanket of snow often eliminates much of the ground pattern and makes blending difficult. Differences in texture and color disappear or become less marked. Snow-covered terrain, however, is rarely completely white. By taking advantage of dark features in the landscape—communication lines, streambeds, evergreen trees, bushes, shadows of snowdrifts, folds in the ground, and the black shadows of hillsides—a unit on the move or halted successfully blends itself into the terrain. However, exhaust, ice fog, and infrared signatures are difficult to overcome regardless of how well the unit is hidden.

Good route selection in snow-covered terrain is usually more important than any other camouflage measure. Because of the exposed tracks, skis and snowshoes are not used near the area since their marks are more sharply defined than foot tracks, and may be discovered with infrared imagery. To avoid

*Firing from behind a wall**Firing from a loophole**Firing from a roof peak**Position improved with sandbags*

tracking up the area, personnel, vehicles, and material are restricted from open areas. Well-concealed positions in snow terrain are easily identified when the snow melts, unless precautions are taken. Light discipline is enforced to prevent disclosure of the position. Compacted snow on well-traveled paths melts slower than the uncompacted snow, and leaves visible white lines on a dark background. The snow is then broken up and spread out to hasten melting.

By following communication lines or other lines which are a natural part of the terrain, tracks are minimized. Tracks coinciding with such lines are harder to identify. A turn-in is concealed and the tracks themselves continued beyond the point. Windswept drift lines cast shadows and are followed as much as possible. Straight tracks to an important installation are avoided. Snow region camouflage nets and paints assist in camouflage operations.

### Urban Areas

Because vegetation is scarce in urban areas, maximum use is made of the shadows available. Outside buildings, vehicles and defensive positions use the shadows to obscure their presence. Troops inside buildings observe from the shadow side of a window in order to be inconspicuous. Combat in the urban environment usually produces considerable rubble from damaged buildings and roads. This material is used for obstacles as well as camouflage for defensive positions. These positions are blended into the terrain and placed behind rubble as it would naturally fall from a building.

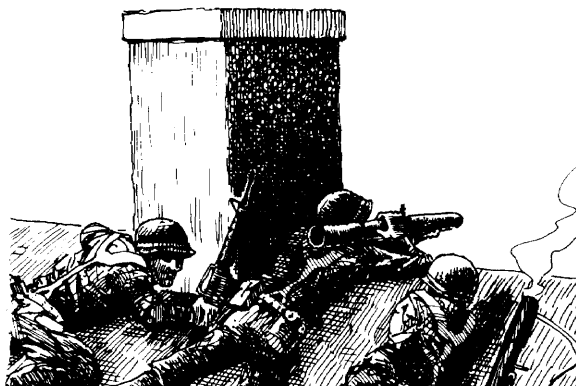
In urban areas, the prime concerns for individual fighting positions are exposure and muzzle flash. When firing from behind a wall, the soldier fires around cover (when possible), not over it. When firing from a window, the soldier avoids standing in the opening and being exposed to return fire.



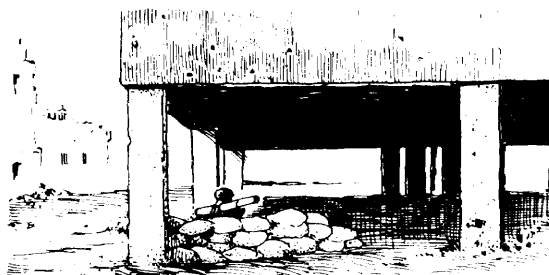
Also, the soldier avoids firing with the gun muzzle protruding, especially at night when muzzle flash is so obvious. When firing from a loophole, the soldier gains cover and concealment. The soldier is positioned well back from the loophole to keep the weapon from protruding and to conceal muzzle flash. When firing from the peak of a roof, soldiers use available cover.

The principles for individual fighting positions also apply for crew-served weapons positions, but with the following added requirements. When employing recoilless weapons (90-mm RCLR and LAW), the soldiers select positions which allow for backblast. Shown is a building corner improved with sandbags to make an excellent firing position. Similarly, another means of allowing for backblast while taking advantage of cover in an elevated position is also shown. When structures are elevated, positions are prepared to take advantage of overhead cover. However, care is taken to ensure that backblast is not contained under the building, causing damage or collapse of the structure, or possible injury to the crew. When machine gun positions are fixed, the same consideration as individual positions is given to exposure and muzzle location. For further information on camouflage operations, refer to FM 5-20.

*Elevated position*



*Position with overhead cover*



*Fixed machine gun position*

